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PUBLIC SCHOOL BONDING IN IOWA

by

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INTRODUCTION

In 1922 the writer made a study of the status of school indebtedness in Iowa.[1] At that time the public schools of Iowa were found to have a bonded debt of $47,609,931.84. No attempt was made, however, to study the trend of such debt, nor was any attempt made to suggest a remedy. This study shows the trend of bonded indebtedness in the state of Iowa and for the country as a whole and offers as a suggestion a formula to be used by boards of education in determining their bonding policies.

It is apparent that some means must be devised to check the constantly rising bonded debt for schools. The state has fixed a legal bonding limit, and already some schools have reached that limit. For the state as a whole, schools are constantly selling each year more bonds than they are retiring. Such procedure must inevitably end in an increasing bonded indebtedness, in an approach to the bonding limit, and in costly interest payments.

The money derived from school bond sales in Iowa represents capital outlay and funding bonds. In a recent study of school bonds, John Guy Fowlkes shows that bonds are issued only where large sums of money are needed, and that such bonds are used primarily for capital outlay and refunding purposes.[2]

It is commonly accepted that communities should so far as possible meet current expenses from current revenue. Where this is impossible schools have resorted to bond issues. However, such bonds should be liquidated at an early date to prevent the accumulation of a large bonded debt and be distributed so as to equalize the burden of such expenditure over a period of years.

TREND OF SCHOOL BONDED DEBT

The tremendous rise of the bonded debt is significant. Several factors have operated to occasion such an increase. Increased interest in education, increased building, increased building costs, the policy of issuing straight term bonds, and the refunding of issues at maturity are some of the chief contributing factors. However, better planning of school buildings will result in an appreciable saving. Proper building policies will materially reduce building costs. The refunding of bond issues and the retirement of bonds can be effectively administered with increased efficiency and with a significant saving in interest. There is a decided trend toward serial bonds at present, which is a step in the direction of economy and efficient administration.

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[1] *The Status of Bonded Indebtedness of Iowa Schools,* Master's Thesis by M. C. Del Manzo, University of Iowa, 1922.

[2] Fowlkes, John Guy, "Justifying a Bond Issue for School Purposes," *American School Board Journal,* Vol. 66, No. 4, pp. 49-61 (April, 1923).

Large numbers of school districts are bonded to approximately the full value of their school property. Some have even reached their legal bonding limit. "The average ratio of school debt to school property is well under 50 per cent, although rising rapidly. The median percentages by states were 17.1 in 1910, 21.6 in 1915, and 26.1 in 1920.[3]" "The rapid increase of school bonding makes it increasingly important for the state to control local borrowing; and a more careful limitation of the life of such bond issues and of the powers of refunding would seem desirable."[4]

Financial Pressure Demands Careful Bonding

School costs increased rapidly between 1913 and 1923. This increase was the direct result of several factors. The Research Division of the National Educational Association attributes the rise in school costs to the following factors.[5]

"First, there has been a rapid increase in school attendance. While the total population increased 14.66 per cent between 1913 and 1923, the average daily attendance in school increased 40.89 per cent. At least 41 per cent of increased school costs may be charged against increased attendance.

"Second, more dollars were required in 1923 to purchase a given amount of service and commodities than in 1913. The index numbers of the United States Department of Labor indicate that $173 in 1923 went no farther in maintaining a school than $100 in 1913. An increase of 73 per cent in school costs may, therefore, be charged to the depreciation of the dollar.

"Third, several other factors in addition to increased attendance and the depreciation of the dollar have made greater school expenditure necessary.

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[3] Educational Finance Inquiry Commission, *Financial Statistics of Public Education in the United States* 1910-1920, pp. 68, 69.

[4] *Ibid.*, p. 81.

[5] *Research Bulletin, National Education Association,* Vol. 2, Nos. 1 and 2, pp. 5-15 (1924)

a. Increased enrollment in the high school where per-pupil costs are at least twice as great as in the elementary school.
b. The increased length of the school term.
c. The construction of new buildings postponed during the war period. At the same time current building needs had to be met.''

Practically all the increases have been due to factors beyond the control of school officials. ''The growing complexity of civilization, the loss in influence of some of our institutions are each year throwing greater burdens upon the school.''[6]

It is evident that certain school costs cannot be reduced. So long as attendance increases, so long as new burdens are placed upon the school, the costs must rise, and such costs may be justified. A nation can take no wiser course than to educate its children properly.

On the other hand, careful school financial accounting and budgeting will be effective in curtailing expenditures. The discussion is limited here to school bonding. Inadequate methods have been used in the past. Hit and miss bonding policies should no longer be permitted.

Attention must be given to scientific building programs, equalization of the debt service, serial bond issues, and proper manipulation of the sinking fund in states where such funds exist.

PURPOSE OF THIS STUDY

This study presents a simple formula by means of which the total bonding policy best suited to a given school system can be found. It takes into account the various factors affecting school bonds. The prime purpose of this study is to aid in reducing the bonded indebtedness of schools and to assist boards of education in setting up their bonding programs.

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[6] *Ibid.*, p. 7

CHAPTER I

BONDED INDEBTEDNESS IN IOWA

INCREASE IN SCHOOL DEBT

The tables in this chapter constitute a summary of the facts of school indebtedness for Iowa over a period of twelve years, 1910 to 1922. Table 1 on page 11 summarizes the data on bonded indebtedness for the state from 1910 to 1922.

A survey of the situation now existing in Iowa shows that more than 75 per cent of all school districts in the state have some bonded indebtedness. No town above 2,500 in population is without a bonded debt. For the state as a whole approximately 37 per cent of the legal bonding capacity is being utilized. Numerous schools have reached their legal bonding limit. The rise of the consolidated school has added $19,253,884.00 since 1910. For all city groups there exists a gradual accumulation of the school bonded debt.

In the school year 1910-11, the total bonded indebtedness was $6,533,000; in 1922 it had increased to $47,609,931. This increase was $41,076,931, or 628 per cent.

This increase in school indebtedness is the result of several factors already mentioned in the introduction. Increasing numbers of children must be housed. Buildings, construction of which was postponed during the war emergency, must be provided. Failure to provide adequately for the retirement of bonds has also contributed heavily to the rising bonded indebtedness.

INCREASED DEBT ON A PUPIL BASIS

The significance of the increase is readily seen when such increased indebtedness is calculated on a per-pupil basis. Table 2 on page 12 shows the bonded debt on such basis for the period 1910-1922. The data presented show the median amounts for each group and year. It is evident from the following table that on the per-pupil basis schools are quite widely distributed in the amount of bonded debt. Taxation must of necessity differ in districts having as low a debt as $1.00 per pupil in average daily attendance

TABLE 1

BONDED INDEBTEDNESS OF IOWA SCHOOLS

School Year	City Group	Outstanding Bonds
1910-11	First class cities	$3,297,400.00
	Second class cities	1,506,300.00
	Towns under 2000	1,659,000.22
	Small towns (not consolidated)	44,300.00
	Consolidated (urban)	26,000.00
	Consolidated (rural)	....
	State total, 1910-11	$6,533,000.22
1915-16	First class cities	$4,266,000.00
	Second class cities	4,077,250.00
	Towns under 2000	4,989,032.15
	Small towns (not consolidated)	29,600.00
	Consolidated (urban)	2,313,463.69
	Consolidated (rural)	....
	State total, 1915-16	$15,675,345.84
1920-21	First class cities	$ 9,853,605.00
	Second class cities	7,400,675.00
	Towns under 2000	6,254,780.00
	Small towns (not consolidated)	145,545.00
	Consolidated (urban)	12,523,028.00
	Consolidated (rural)	4,377,431.00
	State total, 1920-21	$40,555,064.00
1921-22	First class cities	$13,853,600.00
	Second class cities	8,020,161.84
	Towns under 2000	6,652,320.00
	Small towns (not consolidated)	335,850.00
	Consolidated (urban)	13,965,950.00
	Consolidated (rural)	4,782,050.00
	State total, 1921-22	$47,609,931.84

compared to districts with a debt per pupil of $2148.15[1]. Nor is it of little consequence to find that for all Iowa schools having a bonded debt in 1922 the mean debt per pupil in average daily attendance was $168.91 This amount was $125.32 more per pupil than in 1910, an increase of 278 per cent.

DEBT SERVICE

When the same facts are presented on the basis of debt service the significance of the unequalized burden is more apparent. Table 3 on page 13 shows the mean debt service for each year studied.

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[1] Russell, W. F., Holy, T. C., Stone, R. W., and others. *The Financing of Education in Iowa,* Vol. 8, Report of the Iowa Division of the School Finance Inquiry.

On the per-pupil basis, schools are annually paying $6.53 more than in 1910 for such item, an increase of 117 per cent. It is further noted that in 1922 the debt service on the per-pupil basis varied from $0.15 to $247.04.

TABLE 2

IOWA BONDED DEBT PER PUPIL IN AVERAGE DAILY ATTENDANCE

School Year	City Group	Mean Debt
1910-11	First class cities	$46.28
	Second class cities	32.51
	Towns under 2000	54.80
	Small towns (not consolidated)	64.32
	Consolidated (urban)	60.86
	Consolidated (rural)	
1915-16	First class cities	$53.88
	Second class cities	66.49
	Towns under 2000	91.79
	Small towns (not consolidated)	64.01
	Consolidated (urban)	146.71
	Consolidated (rural)	
1920-21	First class cities	$122.40
	Second class cities	98.53
	Towns under 2000	132.10
	Small towns (not consolidated)	145.60
	Consolidated (urban)	301.74
	Consolidated (rural)	356.67
1921-22	First class cities	$161.45
	Second class cities	83.78
	Towns under 2000	127.50
	Small towns (not consolidated)	449.85
	Consolidated (urban)	284.34
	Consolidated (rural)	337.84

BONDS SOLD VS. BONDS RETIRED ANNUALLY

In 1910 the schools of Iowa sold $798,887 worth of school bonds. In 1922 the bond sales were $7,595,904, an increase of $6,797,017, or 850 per cent. In order to keep the bonded debt fairly constant it is necessary to retire annually approximately the same amount of bonds sold each year. In 1910 there were $532,025 worth of bonds retired, or $266,862 less than were sold that year. Each succeeding year the difference became greater until in 1922 the bonds retired totalled only $1,063,091, or $6,532,813 less than the amount of bonds sold. Such procedure can mean but one thing, a rapidly rising indebtedness. Growth in taxable income must take care of growth in school population, and contracted debts must be liquidated or the

TABLE 3

DEBT SERVICE PER PUPIL IN AVERAGE DAILY ATTENDANCE

Year	City Group	Mean Debt Service
1910-11	First class cities	$ 4.94
	Second class cities	3.87
	Towns under 2000	5.49
	Small towns (not consolidated)	6.50
	Consolidated (urban)	17.30
	Consolidated (rural)	
1915-16	First class cities	$4.59
	Second class cities	4.39
	Towns under 2000	8.80
	Small towns (not consolidated)	7.25
	Consolidated (urban)	8.96
	Consolidated (rural)	
1920-21	First class cities	$ 8.03
	Second class cities	7.63
	Towns under 2000	10.31
	Small towns (not consolidated)	16.41
	Consolidated (urban)	18.11
	Consolidated (rural)	22.07
1921-22	First class cities	$ 9.95
	Second class cities	8.48
	Towns under 2000	12.97
	Small towns (not consolidated)	34.59
	Consolidated (urban)	19.01
	Consolidated (rural)	21.97

schools will soon meet an overpowering tax burden in interest payments and bond liquidation. At present only 2.23 per cent of the outstanding bonds are annually retired. At the present rate of retirement it would take exactly 45 years for Iowa to liquidate the present school debt, providing no more bonds were sold and no bonds were refunded. When one considers the amount of new building and replacement necessary in that time and the number of bond issues to be refunded the situation is indeed grave.

REFUNDING BOND ISSUES

A study of the bonds refunded from 1910 to 1922 shows approximately the same amount refunded in each year, namely, $250,000. With the present method of retirement the amount of bonds to be refunded will materially increase, since many of the larger issues, floated within the past few years, are straight term bonds, and the majority of the larger serial issues have definitely provided for refunding a major portion of such issues after twenty years. The result will mean a longer than 45-year period to liquidate the present debt, and in some cases buildings will not be paid for until they are discarded or have been discarded.

INTEREST COSTS

The rise in interest costs has been even more pronounced than that in outstanding bonds. During the war period interest rates increased from four to six per cent. Approximately 17 per cent of the outstanding bonds in 1922 drew a six per cent interest rate. Approximately fifty per cent of the present outstanding bonds were issued at five per cent. The total increase in interest payments on outstanding bonds between 1910 and 1922 was $2,061,689.65, an increase of 712 per cent. A second factor in increased interest costs is the accumulation of the bonded debt. It is startling to find that the interest payments in 1922 were five per cent of the total school expenditures of the state for that year, and on a per-pupil basis the interest cost alone was $6.37 more in 1922 than in 1910.

Iowa faces a school bonded indebtedness problem. In 1910 the per-capita indebtedness for educational purposes was $1.23; in 1915 it was $4.32, and in 1920 it had grown to $11.17. For the entire United States the median amount in 1920 was $7.06.[2]

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[2] The Educational Finance Inquiry Commission, *Financial Statistics of Public Education in the United States*, 1910-1920, Tables 53 and 55, pp. 73, 76.

CHAPTER II

SOCIAL AND ECONOMIC ASPECTS OF SCHOOL BONDING

LEGAL LIMIT OF INDEBTEDNESS

In the foregoing chapter the definite trend toward a rising bonded indebtedness for schools has been considered. Certain social, economic, and administrative aspects of the problem demand attention.

In Iowa the legal limit of school bonded indebtedness is five per cent of the value of the taxable property within the school district. Whenever a school district approaches the legal bonding limit further capital outlay is impaired. Experience has shown that a large bonded debt often hinders necessary improvements. Since the war, numerous cities have been forced to expend large sums for building purposes. Many of these cities have found themselves near the legal bonding limit. Some cities have reached such limit. A bulletin prepared by the United States Bureau of Education makes the following comment: "From the data which the bureau has been able to gather it is reasonable to assume that at least one-half of the children of the country are housed in buildings nearly one quarter of a century old. This means that more than one-half of the children are housed in buildings that have practically none of the educational facilities of a modern school plant. Furthermore, these buildings are not fire-proof. This means that it would be necessary to erect immediately 250,000 classrooms at a cost of $3,000,000,000."[1] Building necessitates increased bonding. For many cities and smaller communities as well, this will mean approaching or exceeding the bonding limit without having provided for present or future needs.

SOCIAL AND ECONOMIC ASPECTS

Whether a city or small community shall bond or not bond is ultimately decided by the people of that community. In cases where the present indebtedness already approaches the legal limit, social and political considerations may decide the question. In such cases building programs may be lost regardless of existing needs. Where a large indebtedness exists, building propaganda is frequently used in order to influence favorably a bond vote which may ultimately result in a lack of confidence in the administration. Schools are costly, and prolonging the debt does not pay the debt but rather adds to the original cost.

---

[1] Swift, F. H. *A Biennial Survey of Public School Finance in the United States*, 1920-22. Bulletin No. 47, Bureau of Education, p. 10 (1923)

An unusually large bonded indebtedness frequently imposes problems difficult of solution. Where replacement of school buildings is necessary the presence of a large debt may prevent such replacement. This not only curtails the work of the schools but does the particular children affected an injustice. It produces neither economy nor equality of educational opportunity. Thousands of children are to-day housed in buildings which should be replaced. Unless building can proceed, the congestion caused by growth will make the situation increasingly worse, especially in the larger cities. The total interest cost alone for many cities would provide adequate building facilities.

The remedy lies in the direction of expedient bonding. Most writers recommend serial bonds liquidated at an early date. In the larger cities the desirability of financing capital outlay from bond sales is open to question. Here building needs are more or less constant and direct taxation for building purposes is far more economical.

Unforeseen Disasters

Not only does the large outstanding debt handicap school officials in providing adequately for replacement and growth, but occasionally it seriously interferes with an unexpected building demand. Unforeseen disasters, such as fires, floods, and storms may destroy a school building. If the school district is bonded to the limit the replacement of such building may prove to be legally impossible. Granting the possibility of going beyond the legal limit, the former debt must still be paid, though the building it represented is destroyed. The burden imposed by such disaster may, in the face of a large indebtedness, prove beyond the community's ability to pay.

WHO PAYS FOR SCHOOL BONDS?

As is practically true over the United States, ninety per cent of the local school budget in Iowa is paid by the local community. Approximately twenty per cent of the budget goes for capital outlay. This amount together with the interest costs must be paid by the local community. It is imperative, therefore, that the total bonding costs be reduced to a minimum. School officials are helpless in reducing building needs, but they can make proper provisions for financing bonding programs. This demands scientific building policies, buildings constructed economically, and bond and interest payments so adjusted as to require the least total expenditure and at the same time take into account the ability to pay and the equalization of the burden over a period of years.

WHAT KIND OF BONDS

Certain economists contend that bonds issued by a municipality should be of long duration. Lagerquist in his book on *Investment Analysis* says, "No important study of the effect of duration of municipal bonds in the United States upon price has ever been made, and the difficulty of divorcing it from other influences would probably make it difficult to establish any definite conclusions."[2] There is a wealth of material on municipal bonds which has never been studied which Lagerquist thinks we will soon be forced to investigate, and he concludes by saying that the maximum term for these securities enacted by law should be less than the term of the improvement. Chamberlain expresses the attitude of certain economists who favor term bonds when he says, "Long life possessed by a bond is often a desirable feature in that the investor may lay aside money in funded obligations where the principal may remain untouched and the interest collected with no more difficulty than to cash semi-annual coupons."[3] Frequently such interest rates are lower than those on shorter investments. For this and other reasons taxpayers often conclude that long term investments are more desirable for a municipality, maintaining that they can use to better advantage the difference in cost between the interest on long term bonds and that on the more costly short term bonds. However, this is a fallacy. A comparison of the difference in annual and total interest costs for an actual case appears below. The present outstanding school bonds of a city of 50,000 population were tabulated in three ways. First, the bonds were arranged on a straight term bonding policy with interest at four per cent; second, the same bonds arranged on a straight term policy with a sinking fund accumulated at 4 per cent; third, the bonds were arranged serially at an interest rate of five per cent.

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[2] Lagerquist, *Investment Analysis*, p. 597.

[3] Chamberlain, Lawrence. *The Principles of Bond Investment*, p. 58.

TABLE 4

STRAIGHT TWENTY-YEAR BOND PROGRAM, CITY A

Year	Outstanding Bonds	Bonds Sold	Annual Interest	Bonds Retired	Annual Debt Service
1921		$382,000	$ 15,280		$ 15,280
1922	$382,000		15,280		15,280
1923	532,000	150,000	21,280		21,280
1924	658,000	126,000	26,320		26,320
1925	858,000	200,000	34,320		34,320
1926	858,000		34,320		34,320
1927	858,000		34,320		34,320
1928	858,000		34,320		34,320
1929	858,000		34,320		34,320
1930	858,000		34,320		34,320
1931	858,000		34,320		34,320
1932	858,000		34,320		34,320
1933	858,000		34,320		34,320
1934	858,000		34,320		34,320
1935	858,000		34,320		34,320
1936	858,000		34,320		34,320
1937	858,000		34,320		34,320
1938	858,000		34,320		34,320
1939	858,000		34,320		34,320
1940	858,000		34,320	$382,000	416,320
1941	476,000		19,040		19,040
1942	476,000		19,040	150,000	169,040
1943	326,000		13,040	126,000	139,040
1944	200,000		8,000	200,000	208,000
Totals			$686,400	$858,000	$1,544,400
Total interest cost					$ 686,400
Average annual interest					28,600
Total debt service					1,544,400
Sinking fund					None
Average annual debt service					64,350

The same annual debt service amount was used in the last two plans in order to make them comparable. The interest rates for the sinking fund plan were at rates now being paid; these vary from four to four and three-fourths per cent. (Sinking funds for school bond retirement are illegal in Iowa.)

Contrary to opinion the advantage from the standpoint of annual and total interest costs is in favor of the serial plan even with lower rates on the term bond, which in practice is questionable. If the interest rate on the sinking fund were the same as the rate on the bonds, both the serial and the sinking fund plans would be identical in cost, where the annual debt service is equal in amount. But the interest rate earned by a sinking fund is usually lower than the rate paid on bonds. Exceptions may occur where the sinking fund has been invested to unusual advantage. If the interest rates are identical for both plans the total interest costs still favor the serial plan because the sinking fund is invested at a lower rate. In the illustration for the serial plan an interest rate of five per cent was used. This is slightly in excess of the rate that was actually obtained. It was chosen to offset any argument stating that serial bonds sell at higher rates, which is questionable in the case of

TABLE 5

SERIAL BOND PROGRAM, CITY A

Year	Outstanding Bonds	Bonds Sold	Annual Interest	Bonds Retired	Annual Debt Service
1921	$382,000	$382,000	$ 19,100	$ 39,000	$ 58,000
1922	343,000		17,150	41,000	58,150
1923	302,000	150,000	22,600	35,500	58,100
1924	416,500	126,000	27,125	31,000	58,125
1925	511,500	200,000	35,575	22,500	58,075
1926	689,000		34,450	23,500	57,950
1927	665,000		33,275	25,000	58,275
1928	640,500		32,025	26,500	58,525
1929	614,000		30,700	27,500	58,200
1930	586,500		29,325	29,000	58,325
1931	557,500		27,875	30,500	58,375
1932	527,000		26,350	32,000	58,350
1933	495,000		24,750	33,500	58,250
1934	461,500		23,075	35,000	58,075
1935	426,500		21,325	37,000	58,325
1936	389,500		19,475	39,000	58,475
1937	350,500		17,525	41,000	58,525
1938	309,500		15,475	43,000	58,475
1939	266,500		13,325	45,000	58,325
1940	221,500		11,075	47,000	58,075
1941	174,500		8,725	49,500	58,225
1942	125,000		6,250	52,000	58,250
1943	73,000		3,650	54,500	58,150
1944	18,500		925	18,500	19,425
Totals		$858,000	$501,125	$858,000	$1,359,125
Average annual debt service					$ 56,630
Total interest					501,125
Total debt service					1,359,125
Average annual interest					20,838
All bonds at 5% interest					

established cities. The rate allowed for deposits in the sinking fund was taken at four per cent. This again is slightly higher than is usually found in practice. A comparison of the three plans presented shows that the serial plan has the advantage not only in terms of total cost but also on the basis of average annual interest payments and debt service amounts.

Fraser Brown makes the following comment: "It is believed that the best modern thought on the subject of municipal financing requires that the term of bond issues shall not exceed the life of the improvement, so that the burden of the improvement will not have to be borne by persons who do not enjoy its benefits. It is also obvious that the longer the bonds run, the greater the interest charge, which in the case of bonds having a long term, may greatly exceed the principal itself."[4]

Lagerquist makes the following comment relative to serial bonds: "With municipal issues, and issues of corporations whose assets depreciate rapidly, . . . the serial form is undeniably the soundest method of retiring bonds. In municipal issues, it is a saving to the taxpayers, . . . as well as the most effective method of promoting conservative financing in municipalities. In the growing tendency of over-expenditures, the deferring of obligations to a distant future date is likely to result in reckless expenditure, especially where the politicians are attempting to court public favor. When payments are to be met in the more immediate future a tax must be raised, and an increase in taxes is not voted without serious thought."[5]

THE SINKING FUND

The issuing of straight or long-term bonds presents a further difficulty in that it requires one of three things: either an unusually heavy tax in a given year when the bonds mature, or the maintenance of a sinking fund, or the refunding of all or a part of the issue, at maturity.

Bonds are paid from the proceeds of taxation. The amount of money which would have to be raised to meet a large bond maturing in a given year could not, in small districts, be collected by direct taxation. Hence, the principle of the sinking fund was applied to municipal bonding. But the sinking fund has been in bad

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[4] Brown, Fraser. *Municipal Bonds.* p. 79.

[5] Lagerquist, W. E. *Investment Analysis,* p. 50.

TABLE 6
SINKING FUND PLAN, CITY A

Year	Outstanding Bonds	Bonds Sold	Int. Rate	Annual Interest	Bonds Retired	Annual Debt Service	Debt Service Deposit	Sinking Fund 4%
1921		$382,000	5 %	$ 19,100		$ 58,279.25	$39,179.25	$39,179.25
1922	$382,000			19,100		58,279.25	39,179.25	79,925.67
1923	532,000	150,000	4½%	25,850		58,279.25	32,429.25	115,551.95
1924	658,000	126,000	4½%	31,520		58,279.25	26,759.25	146,933.27
1925	858,000	150,000	4¾%					
		50,000	4½%	40,895		58,279.25	17,384.25	170,194.85
1926	858,000			40,895		58,279.25	17,384.25	194,386.89
1927	858,000			40,895		58,279.25	17,384.25	219,546.62
1928	858,000			40,895		58,279.25	17,384.25	245,712.73
1929	858,000			40,895		58,279.25	17,382.25	272,925.49
1930	858,000			40,895		58,279.25	17,382.25	301,226.76
1931	858,000			40,895		58,279.25	17,382.25	330,660.08
1932	858,000			40,895		58,279.25	17,382.25	361,270.73
1933	858,000			40,895		58,279.25	17,382.25	393,105.81
1934	858,000			40,895		58,279.25	17,382.25	426,214.29
1935	858,000			40,895		58,279.25	17,382.25	460,647.11
1936	858,000			40,895		58,279.25	17,382.25	496,457.24
1937	858,000			40,895		58,279.25	17,382.25	533,699.78
1938	858,000			40,895		58,279.25	17,382.25	572,432.02
1939	858,000			40,895		58,279.25	17,382.25	612,713.55
1940	858,000			40,895	$382,000	58,279.25	17,284.25	272,606.34
1941	476,000			21,795		58,279.25	36,484.25	319,994.84
1942	476,000			21,795	150,000	58,279.25	36,484.25	219,278.88
1943	326,000			15,045	126,000	58,279.25	43,234.25	145,284.28
1944	200,000			9,375	200,000	58,279.25	48,904.32	
Totals		$858,000		$817,900	$858,000	$1,398,702.10		

Average annual debt service	$58,279.25	Total debt service	$1,398,702.10
Average annual interest	34,079	Sinking fund accumulated at 4%	
Total interest	817,900		

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repute for some years due to the inadequate way in which it has been handled. Iowa, like many other states, does not permit such a fund. Fraser Brown, in his book on *Investment Bonding,* says of the sinking fund: "At an early period the principle of the sinking fund was applied to municipal financing. A sinking fund is formed by setting aside a sum of money at stated intervals to provide for the payment of all or a part of the principal of a debt. It is a method of sinking or extinguishing it. Simple as this is in theory the difficulty with the sinking fund is that it is not carefully followed. Says Professor Jordan, 'Sinking funds have been notoriously misused for purposes absolutely foreign to their object.' "[6] Lagerquist writes of the sinking fund: "It used to be said, and the statement is still made, that the sinking fund has the advantage of a lower interest rate than the serial method payment. There may originally have been cases where a municipality's maiden attempt at serial bonds necessitated a higher interest rate, but this was not general or long continued . . . So common have been the looseness and errors with which sinking funds have been administered since their first conception that their use must be seriously questioned except under the most rigid control. Under the rigid economy necessary for safety, they are expensive.

"Even if the sinking fund method will do all that is claimed for it, its plan of payment is more costly than the serial method. This is due to the fact that interest must be paid on the entire loan throughout its life, while under the serial method the interest is annually diminishing and also to the fact that sinking fund investments, as pointed out, bring in only a low average yield."[7]

A good illustration of the two methods may be found in Chandler."[8]

REFUNDING A DEBT

The refunding of bond issues at maturity is also in bad repute. In the first place, such a method is costly in interest; in the second place, it violates the original intention. Lagerquist says regarding refunding of debts: "In civil loans, with the exception of national loans, the arguments for refunding bonds do not apply, as the civil division has no means of making profits from earnings as a corporation. On the other hand, the burden of taxation in the payment of interest under continuous refunding of an issue, is simply prolonging the obligation and forcing the public to pay more interest charges.''[9]

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[6] Brown, Fraser. *Investment Bonding,* p. 75.

[7] Lagerquist, *op. cit.,* pp. 600, 602.

[8] Chandler, Alfred D., *Metropolitan Debts of Boston and Vicinity,* p. 73.

SHOULD THE NEXT GENERATION PAY?

It is frequently advocated that the children now enjoying the benefits of our schools should later be given an opportunity to pay for them. In a sense this is true. On the other hand it is a question whether one generation has the right to vote an obligation for a succeeding generation to pay, even though they do enjoy its benefits. School costs are increasing by leaps and bounds, and they will continue to do so. With the already large bonded debt the next generation will have more than its share of the burden. Nor is the fact to be overlooked that buildings must be replaced. This likewise will fall upon the following generations. Equalization of the burden requires that each generation do its part in providing and paying for school needs.

CONCLUSION

It is evident that more care must be exercised in planning bond programs. This is demanded because of certain social and economic reasons. Economy must be practiced in handling bonds. Equalization of payments is imperative. Moral hazards due to an over-powering indebtedness will have to be considered in school bonding if we are to provide adequately at all times.

Long term bonds meet with objection from both the sinking fund and refunding possibilities. All things considered, the serial plan is undoubtedly the soundest method of retiring school bonds and should be adopted.

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[9] Lagerquist, *op. cit.*, pp. 693-694.

CHAPTER III

THE STATUS OF SCHOOL BONDING POLICIES AND CRITERIA ESSENTIAL FOR EFFICIENT BONDING

PREVAILING BONDING POLICIES

Adequate data are not available to show the bonding policies of schools in Iowa. In 1921 the writer sent a questionnaire on bonded indebtedness to all of the schools in the state. School districts were asked among other things to indicate their bonding policy. Examination of approximately eighty per cent of the districts gave evidence that the majority of schools issue their bonds without any definite policy. Usually the district specifies the amount needed for an improvement, and the bonding house employed arranges the bonding schedule. Certain of the larger cities have attempted to establish bonding policies, but examination of a number of such schedules reveals the fact that they, too, have made inadequate provision for bond retirement. Numerous school surveys have been made and bonding policies recommended. Schools where such survey reports exist are indeed fortunate. Survey reports indicate that it is common practice for districts to sell their bonds over long periods. In the majority of cases refunding has been customary. Examination of bonding programs where refunding has taken place shows that the annual debt service fluctuates considerably. There is little or no effort made to equalize the burden.

It is regretted that so little information is available to guide school districts facing a bonding program. Much of the literature available is technical in nature. The best single publication of recent date is a book by John Guy Fowlkes, entitled *School Bonds*, published by the Bruce Publishing Company, Milwaukee, Wis.

CRITERIA ESSENTIAL IN SCHOOL BONDING

This study does not propose to review in detail all the criteria essential in sound bonding but to combine the more essential elements in a simple way so that school officers may use them in determining an optimum debt service. Certain difficult problems are met in establishing a bonding policy. Some of the more important ones deal primarily with the building program. They are as follows: to provide for growth in school population; to provide sufficiently to make the present plant adequate; to establish an annual debt service of optimum amount to handle a given bond program; when to issue and retire bonds, so as to equalize the debt service and also keep the total outstanding indebtedness well below the legal limit; to sell bonds to advantage on the market; and to determine the bond burden in terms of the district's ability to pay. These will be discussed in the order presented, with special emphasis on the bond program.

Providing For The School Population

Since school bonds are sold primarily for capital outlay purposes, only this phase of the problem will be discussed. From the standpoint of providing school facilities, three major problems arise in bonding. These are: first, to provide funds sufficient for adequacy; second, to provide for replacement of the present plant; and third, to provide for future growth of school population. No program is adequate that neglects any one of them.

Adequacy refers to the present plant. It is necessary to know whether the present school buildings are in good condition and entirely adequate for present needs. If the plant is being used to full capacity, or beyond its full capacity, the required pupil capacity must be determined. This must be done for each type of school; namely, the elementary school, the junior high school, and the senior high school. Often school populations can be shifted or district lines changed, thus making it possible to equalize the building load. Provision must be made for pupils who are unprovided for or are unsatisfactorily housed at the present time. This number should be scientifically determined. Extensive remodeling of any kind and immediate additions should be considered under adequacy.

Replacement must also receive consideration. It would be futile to plan a bonding program and find within a few years that an older building needed to be replaced. A bonding program must be all-inclusive. The entire school plant should be carefully scored by an efficient staff with a standard score card designed for scoring school buildings. Buildings that score exceptionally low, or are poorly located, should be recommended for displacement at the very earliest date. Careful estimates of the probable life of all of the buildings should be made and such data used in planning the bonding program. These estimates should be in terms of replacement costs. It is important in estimating replacement and adequacy to determine first of all the kind of school organization to be adopted for the future. No building program should ever be established before this issue is fully settled.

Growth estimates are also essential. A detailed study of school population over a period of years will enable one to estimate rather closely the school population of the future. This should be done both for the city population and the school population, and the latter for each type of school. By use of the proper formulae, growth may be stated in terms of annual increase or per cent of growth. While such estimates are not entirely reliable, in that certain changes in population due to unexpected developments are impossible to predict, they do reduce the per cent of error involved. Caution should be exercised and predictions limited to a period of reasonable length. It is advisable to make adjustments in the final program probably every five years.

By combining the pupil capacity requirements from the standpoint of adequacy, replacement and growth for each type of school it is possible to ascertain the total building requirements at any given period for each type of school building. Slight changes may be necessary from time to time due to unexpected developments. Before final plans are effected, the city must be completely studied and buildings planned and located in the light of all available data. It is also assumed that the optimum size of building has been determined for a particular city and for each type of school. By ascertaining the probable cost of building for the required needs mentioned above, and determining the years when such buildings are to be erected, an adequate bonding program can be planned.

Ability to Pay and Index of Income

Accurate knowledge of needs scientifically determined is the first essential. Ability to pay for necessary improvement must also be considered. Likewise the early amortization and equalization of the debt burden which the bond program places upon a school community must be provided.

The extent to which a district may bond itself depends upon the legal bonding limit. In Iowa this is five per cent of the total value of taxable property in the school district. The maximum amount annually available for debt service is twenty-eight mills on the taxable valuation or seven mills on the assessed valuation. In addition, the district may vote a ten mill tax annually to pay off bonded indebtedness. But these are purely legal limits and have little to do with the real ability of a community to pay. John Guy Fowlkes writes concerning the ability to pay: "Some of the best measures of a community's ability to finance school building programs are per capita wealth (on true valuation basis), school tax rate, total tax rate for municipal purposes, total and per capita expenditures for capital outlay for schools, bonded debt, and the relation of bonded debt to assessed value."[1] All of these items should be investigated in determining a community's ability to pay.

The ability to pay is grossly misunderstood. A common error often quoted relates to the size of the mill levy as an index of the burden of taxation. The ratio of assessments to true values varies tremendously. The rate of assessment varies from year to year and from place to place. The intent of the law in Iowa is that property should be assessed at its true value and taxed at one-fourth that value. A number of studies have actually shown that property is assessed at approximately forty per cent of its value and taxed at one-fourth of the forty per cent assessment value with wide variations in assessment ratio appearing over the state. From information derived from various sources, Brindley quotes estimates of the ratio of assessed value to actual value varying from 51.56 per cent to 55 per cent for the year 1909.[2] For the year 1903 the estimated ratio is 80 per cent. For the four periods ending 1922, T. A. Polleys, Tax Commissioner for the Chicago Northwestern Railway Company, calculated the average ratio of assessed value of real estate to actual sale value to be 38.5 per cent. In all cases these ratios were determined by comparing the recorded transfer values with the assessed values of identical units of real property."[3] In order to arrive at a true estimate of ability from the standpoint of property valuation, it is necessary to know at what rate the assessment is being made. This can be done for a given district by getting actual transfer values on properties sold in a given year and comparing such values with the assessed value. The percentage can then be ascertained and the true assessed valuations determined.

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[1] Fowlkes, John Guy, "Justifying a Bond Issue for School Purposes." *American School Board Journal*, Vol. 66, p. 49 (April 1923).

[2] Brindley, John E. *History of Taxation in Iowa*, Vol. 1, p. 132 ff.

[3] Russell, *op. cit.*

There is some tendency in the direction of making the assessed valuation of property conform to the true valuation. Omaha, Nebraska, may be cited as an illustration. In 1921 this city changed its rate of assessment to a full valuation basis.

Occasionally it is desirable to show the ability of a community by ascertaining its true valuation. This is especially true where the assessed valuation is very low and the need of funds great. In such cases it is often possible to show that the ability to finance a program is sufficient if placed on a better assessment basis. For practical purposes, however, we are forced to accept the amount available in terms of the present assessment ratio.

Dr. W. F. Russell confirms the statement that the present mill levy in Iowa is a very poor index of the ability to pay. "While it is a common thing for the citizen of Iowa to measure the burden of his taxation by the size of the mill levy, as a matter of fact it is a very poor measure indeed. With the system of fractional valuation in vogue and no adequate state system of equalization from county to county or from locality to locality, it is obvious that there is quite as much room for variation in the evaluation of the taxing base as there is in the mill levy itself."[4]

Russell found that "the fundamental ability of the community to educate its children is a matter of the relationship between the wealth of the district and the number of children to be educated. The wealth was estimated by taking the assessed valuation of the real and personal property reported above, which includes ninety-six per cent of the local tax base. This figure was divided by the number of pupils in average daily attendance, restricting the study to residents of the district alone. This gives the money value of the property in the district per pupil in average daily attendance."[5] The figure for ability represents the amount of wealth per pupil in average daily attendance. The striking lesson for the student, however, is the extraordinary variation from community to community. "In consolidated schools there are approximate variations from \$10,000 to \$75,000 in ability. Similarly in the other than consolidated schools there are extreme variations of from \$3,500 to \$325,000 in ability."[6]

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[4] *Ibid.*

[5] *Ibid.*

It is regretted that more accurate valuation estimates are not available for use. The ability to pay expressed in terms of property assessment or taxation units is seriously open to question. In this study the amount produced by one mill is used as an index of income because it is the best single index now available and practicably applicable to the problem under study. No attempt is made to place bonding on an ability basis. Authorities have stated that the ability to pay must be stated in terms of true wealth or income. "According to the research bulletin of the National Education Association for the year 1920, Iowa ranked sixth of the states of the Union in total estimated wealth and twelfth in the total estimated income. On the basis of the number of persons between the ages of five and twenty, Iowa ranked second in wealth, sixteenth in income, and eleventh in school expenditures, while on the basis of percentage of wealth expended for education she ranked fortieth and thirteenth in percentage of income spent for education. In per capita expenditures for education she ranked tenth, while in per capita income her rank was fourteenth.

These figures indicate a wide range between wealth and income, a variation so wide that a comparison of those items with school expenditures does not give a basis for the determination of the actual burden to the property owner."[7]

Speaking further on income and ability, Russell quotes from the National Bureau of Economic Research for 1919. This organization in 1919 made an investigation of income by states. The estimated income of Iowa was \$1,697,401,000 in 1919, or 2.54 per cent of the national income. It is hoped that eventually the income figures for Iowa as well as for other states will be available and accurate indexes of ability determined for individual localities. The index of income as used in this study is based upon the taxable wealth of a district in relation to the total school enrollment, since no better index is available at this time.

The enrollment basis was chosen because school buildings must

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[6] *Ibid.*

[7] *Ibid.*

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provide for all possible pupil enrollments. The total enrollment figure is certain to provide adequately for pupils, and at the same time guards against underestimation of building costs. Scientific study is urgently needed in this field that a better index may be forthcoming.

Optimum Debt Service

The annual amount of debt service that a given district should pay, all things considered, is, after all, the crux of the problem. By optimum debt service we mean that amount of money which a school district can best afford to pay annually for interest on bonds and the retirement of bonds, based on the ability of the district to pay under existing social and economic conditions and on the total cost of housing the present and future school populations.

The optimum amount of debt service must take into account the factors affecting a building program, the type and cost of bonds, the ability to pay, the life of the improvement, the present indebtedness, and the social and economic factors involved in public school finance. No satisfactory method has been determined whereby a district can ascertain the optimum amount of its debt service. The various elements entering into such an amount have heretofore been only superficially studied. No experience tables exist whereby the life of a school building may be determined. Such studies in depreciation afford a rich field for investigation. Little has been done in studying the social and economic factors involved in public school bonding. Clearly defined methods exist whereby a school district may determine its needs from the standpoint of adequacy, replacement and growth, but they are not being used by many school officials. This study attempts to combine these various elements in the light of available data, and arrive at an optimum amount of debt service which best conforms to practical application. Undoubtedly much study will be given to school bonding in the future. Recent literature indicates that the problem is a vital one and is felt by schools everywhere. Each of the above items should receive scientific study and extended research.

Probable Life of Buildings

Among other items the optimum debt service must take into account the probable life of a building. By probable life is meant the time, usually expressed in years, during which a building may reasonably be expected to render service. Carl Ewald Grunsky, in speaking of the probable life of buildings, says: "It depends not alone upon the time, for an article to become valueless by use, by ordinary wear and tear, but also upon the time when by reason of accidental destruction, inadequacy or obsolescence, the article must be replaced by a new and better one adapted to fulfill its purpose."[8] In discussing depreciation he says: "Depreciation is the lessening in worth of any perishable article which takes place from use and advancing age. It is not solely due to inherent deterioration or to wear and tear; in the arts and sciences and methods of manufacture an article may become obsolete and that due to growth of communities or other causes, appliances or structures may become inadequate and have to be replaced in the course of time by new ones better adapted to the requirements. Every circumstance tending to limit the term of usefulness of an article should be taken into account when its probable life or expectation and consequent rate of depreciation are to be determined."[9]

The lasting qualities of a building so far as wear and tear go are not the essential criteria. Many properties under proper maintenance will last forever. Westminister Abbey was built in the 13th century, Old South Church in 1750, and Washington's home at Mt. Vernon in 1784. These structures are in relatively good state. On the other hand, apparently permanent structures of stone and steel have a short life. Evidence of the latter type is not wanting in any growing city. Inadequacy and obsolescence are determining factors as powerful as wear and tear. An illustration by H. E. Riggs is timely here: "Maintenance may be such as practically to eliminate decay, but obsolescence may affect one unit and not another. Three railroad stations built in the same year, of the same design, in cities of about 8,000 population need not have identical life. One is destroyed by fire within a year, one is built in a city which shows 200 per cent increase of population in a decade and becomes inadequate in eight or ten years, the third is in a city which shows practically no growth in forty years and at the end of that time completely meets the requirements for which it was built.

"In case of such buildings as office buildings or hotels, the change of a city district from retail to wholesale, the shifting of business to a different locality or other like causes, may have a disastrous effect on value by creating obsolescence in the building even though its physical condition be excellent.''[10] Riggs says of obsolescence: ''The elements of obsolescence cannot be tabulated. In general, it may be said that property in small and slowly growing cities may be affected little or not at all by obsolescence while similar property in a large city, especially one that is growing rapidly and making constantly larger demands for the product will have to contend with large losses through obsolescence. It must be remembered that obsolescence constitutes one of the principal reasons for replacement.''[11]

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[8] Grunsky, Carl Ewald, *Valuation, Depreciation and the Rate-Base*, p. 20.
[9] *Ibid.* p. 23.

It is evident, therefore, that depreciation is not solely a matter of wear and tear. Obsolescence, embracing the changing character of the neighborhood, and other factors, such as the possibility of a property being outgrown, inadequate or obsolete, cannot be ignored. For school buildings the problem is more acute in rapidly growing cities. Shifting of population centers, the outward expansion of the business district, the placing of industrial plants near school buildings, and similar factors affect the life of a building. In such cities the plan of bonding must of necessity be such as to amortize the investment in a short period. It is not to be overlooked that new teaching devices, new inventions related to school construction, and changing social and educational demands also affect the life of a school building.

It is quite evident that the average life of a building from the standpoint of construction is an unreliable index to use in determining the length of years a bond shall extend. Brick and stone buildings are usually given a probable life of from thirty to sixty-six years. On the other hand, modern hotels of steel and stone construction are given a probable life of only fifteen to eighteen years. This is largely due to the factor of obsolescence. We cannot, therefore, estimate the life of a school building on the basis of construction alone as has been the common practice. It is reasonable, therefore, to assume the probable life of school buildings to be approximately twenty-five years for purposes of bond retirement. Recent survey reports recommend the replacement of many buildings due to the expansion of the business districts, inadequacy, depleted areas, etc. It is important therefore that estimates of probable life should be conservative. Since bonds sold to supply funds for a building should mature before such building is replaced, it is advisable not to exceed a period of twenty to twenty-five years for bond retirement. Conditions will alter this estimate but it is better to err in the direction of a shorter life.

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[10] Riggs, Henry Earle, *Depreciation of Public Utility Properties*, p. 98.

[11] *Ibid.*, p. 99.

Mention should be made of the problem confronting the poor district. Where the ability to pay does not warrant a debt service that will retire a bond issue within twenty or twenty-five years there are two choices to make, or perhaps a combination of the two. Either the district must accept a longer number of years until the maturity of the bonds, or it must build cheaper buildings, or do both. In Iowa, bonds must mature in twenty years, though they may be refunded after such period. It is conceivable that schools can be built just as efficiently from the standpoint of educational needs and health factors but on a cheaper basis.

Communities as well as individuals vary in the amount of wealth possessed; just as individuals, they must differ in expenditures. Conceivably a wealthy district will build its schools with more elaborate exterior finish and interior decoration, while the poorer district will offer its pupils similar school facilities but not so elaborate in the finishing touches. The ability to pay is then an essential factor in the final determination of the debt service amount.

SELLING AND RETIRING BONDS

The amount of bonds retired annually will depend upon the accepted annual debt service amount. The debt service on the other hand will be determined by the total outstanding debt. The bonding program will determine the amount of bonds to retire within a given period. For a city with a large indebtedness and necessary expansion ahead the retirement of bonds will of necessity be great. Where a district has but one building and no debt the retirement of bonds should so be arranged that each year an increasing amount of bonds will be liquidated. This amount will be greater during the last years of the program, since the interest is less at this time, and an equal debt service amount can thereby be arranged for the entire period. For all types of districts the building needs will determine to a large extent the annual debt service. The retirement of bonds must always be so arranged as to permit the injection of bonds to be sold when needed. Where a large indebtedness exists this is often difficult. Cities should endeavor to reduce their indebtedness at least to the point where the total amount of outstanding debt is less than one-half of the initial cost to build completely a new school plant for the entire city. Retirement of bonds and the injection of new bonds is then relatively simple and at no time should it interfere with needed improvement. The nearer the large city approaches the pay-as-you-go plan the better.

SELLING BONDS TO ADVANTAGE

It may not always be possible, but it is always advisable for a school district to arrange its building program so that some flexibility may be allowed between the time funds made available by bond issues will be needed and the time of selling such bonds on the market. It is also advisable to sell bonds in certain seasons. Lagerquist has an excellent chapter in his *Investment Analysis* entitled "Market Influences on Security Prices" from which we quote: "There are too many influences at work for one to be able to determine what will be the trend of security prices. There are, however, certain big factors and relationships which are based on fundamental causes and which do indicate tendencies in the market affecting the long time fluctuation in the market price."[12] The student of this problem will also find E. W. Kemmerer's *Variations in the Demand for Money* an excellent reference on market prices.[13]

Regarding seasonal variations Lagerquist says: "While the seasonal fluctuations vary with different sections of the country, the fluctuations in the New York money market are the most essential ones to study in relation to investments. However, with the ultimate readjustments that will probably take place under the Federal Reserve System, the seasonal difficulties ought to be greatly reduced.

"The best seasonal indicators of the New York money market are those items which are most responsive to quick changes; namely, call loan rates, very short time loan rates, and the ratios of reserves to deposits. Time loans and bank clearings, according to Professor Kemmerer, while less susceptible to minor influences, mark more accurately the broad swings of the market, but they are unsafe indicators as to the beginning and ending of the seasonal swings.''[14]

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[12] Lagerquist, *Investment Analysis*, p. 168.

[13] Kemmerer, E. W. *Variations in the Demand for Money*, National Monetary Commission, 61st Congress, 2d Session, 1911, pp. 217, 223-224.

Relative to bond prices Lagerquist quotes from Kemmerer:" 'The seasonal effect on bond prices does not cause them to move consistently, or regularly. Also, individual prices may not fluctuate very much, but collectively for the year these fluctuations extend into millions. Bond prices tend to increase in January under the stimulus of an easy money market and to decline quite steadily till the climax of the second swing. With the beginning of the second weak seasonal market, bond prices normally rise to their highest point in early summer. From the first of June until the first of September, bond prices normally take their first pronounced downward move and continue even more steadily until the middle of November, when they tend to move upward following an unsteady advance during December.' ''[15] Expert advice should be obtained by school districts regarding the sale of bonds.

WILL GROWTH IN TAXABLE VALUATION TAKE CARE OF GROWTH IN SCHOOL POPULATION?

School populations have increased during recent years. If in proportion to such increase the taxable wealth has also increased, other things being equal, the increase in school population need not alarm us. For actual growth of pupil numbers, actual dollars must be expended to provide school facilities. Whence are these dollars to come? Must those already supporting the schools pay for the additional pupils, or will the growth in school population be accompanied by growth in taxable wealth?

In the early period of American development each family provided what education it could for its children. Later, groups combined to afford their children an education. As the villages grew in size, more children were added and more families supported the project. Those added helped defray the expenses made necessary by their coming. So, too, should growth in school population today provide its support through added support of taxable wealth. Expressed in simple terms, growth should provide for growth; both the original population and the growth population should build their own schools, maintain, and replace them. In general this principle should hold. If it fails to do this, school districts will have to face the problem of a constantly rising cost of education. Should such a condition exist, it is conceivable that an overpowering school tax burden will result.

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[14] Lagerquist, *loc. cit.*, p. 186.

[15] *Ibid.*, pp. 187-188.

The evidence, however, is in the other direction. Examination of nation-wide trends in school population and wealth indicate that wealth surpasses growth. The same conclusions may be drawn from a study of local state data. Similar evidence is likewise revealed in a detailed study of certain Iowa communities. The evidence at hand shows that growth will take care of growth. In this connection, as with data regarding the life of school buildings, experience tables are sorely needed. A study should be made for all types of cities and school communities to ascertain over extended periods the relationship between growth in school population and growth in taxable valuations. The study should also be extended to include growth in ability to pay on the part of school districts. The evidence from data examined in this study supports the assumption that growth in school population will be taken care of by growth in taxable valuations.

For any given year, growth in taxable valuation may be inadequate in comparison with growth in school population. The increase may not always be in evidence. Over a period of years, however, taxable valuations will show an increase, excepting in certain unusual conditions. The apparent lag in taxable valuations may be due to conditions similar to those found in the business world. An increase in business may not be in evidence until some time after the cause of such increase has been in operation. Likewise a need for a building, due to sudden growth in population, may be apparent before a corresponding increase in assessed valuation appears. An industry developing rapidly within a city may attract population and cause a rise in school attendance before the full benefit of the increased wealth represented is felt through the channels of taxation. The contrary is likewise possible. Increased valuations may exceed in amount school population increases, the latter lagging for certain reasons.

There is a further possibility of growth in school population exceeding growth in taxable valuations. Both may be growing at fairly constant rates, but the one in terms of taxable valuations may not reveal any evidence of growth due to other causes operating in the assessment of properties. This has actually been found true in one case studied. The particular city in question has enjoyed a rather unusual building program. In the four years, 1919 to 1922, when building was most in evidence, the assessed valuations for the city as a whole remained practically constant. In 1919 the taxable valuation based on one-fourth of the assessed valuation was \$2,519,608; in 1922 the taxable value was \$2,558,600, an increase of \$38,992 in taxable valuation or an assessed valuation increase of \$155,968. If the assessed valuation was approximately the true valuation, this amount would build 19 homes at \$8,000 each. If the assessed valuation was 50 per cent of the true value, then 38 homes could have been built. The city actually built within the four year period 564 homes at a total value of \$3,739,000, to say nothing about business and industrial expansion. On the basis of total pupils enrolled in this city one mill actually brought per pupil enrolled \$1.54 in 1919 and only \$1.50 in 1922. On the basis of taxable values the city actually lost per pupil on a one mill basis \$.04. In the light of the facts available it is evident that the assessments in this case have been peculiarly handled. The wealth is there, but it is concealed.

Below are presented the growth data from the standpoint of the nation at large. These figures should be taken only as representative of trend, rather than as actual increases. A figure giving the true wealth or taxation power back of each pupil for the entire United States is almost an impossibility due to variations in taxation and variations in wealth estimates. Corrections have not been made for these variations nor for increased costs and depreciation of currency; but the figures may be illustrative, however, of general conditions, as related to the growth problem. Data for later years are not available.

Table 8 has been compiled for the state of Iowa showing the taxable valuation and total school enrollment in 1915 and 1922. The trend is in the direction of increased wealth per pupil.

Russell made a rather complete study of the estimated income of the people of Iowa published as a part of the Finance Inquiry.[16] Data from the original manuscript are used in Table 9 showing the state income on a per pupil basis in 1915 and 1921.

A detailed study was made for certain cities in Iowa for which complete and reliable data were available to show the per pupil increase in taxable wealth. Table 10, page 39, shows the annual rates of increase in taxable valuations and in growth of school populations for a limited group of cities. The rates of increase are not comparable with one another since data for the same years were not available for all of the cities. The growth in school population and the growth in taxable valuation for any given city are comparable, however, since the same years' data were used for both rates.

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[16] Russell, *op. cit.*

TABLE 7

TOTAL WEALTH OF THE UNITED STATES COMPARED WITH THE TOTAL PUBLIC SCHOOL ENROLLMENT, 1910-1912[17]

Year	Total Wealth	School Enrollment	Wealth per Pupil
1900	$88,517,306,775	15,503,110	$5,709
1904	107,104,211,917	16,256,038	6,589
1912	187,739,071,090	18,182,937	9,352

The rate of increase for the cities studied shows that growth in taxable valuation exceeded growth in school population. The same data were studied on a per-pupil basis. Table 11 should be read as follows: For each pupil enrolled in 1923 in the city of Burlington, one mill produced $1.24. For each pupil enrolled in 1912 one mill produced $1.05. The taxable valuation per pupil is greater in 1923 than in 1912, resulting in this increase. For each pupil enrolled in 1923 one mill produces $.19 more per pupil enrolled than one mill produced in 1912.

TABLE 8

TOTAL EQUALIZED ASSESSED VALUATION OF PROPERTY IN IOWA INCLUDING MONEYS AND CREDITS COMPARED WITH THE TOTAL SCHOOL ENROLLMENT[18]

Year	Total Assessed Valuation Moneys and Credits Included	Total Pupils Enrolled	Valuation per Pupil Enrolled
1915	$4,164,000,000	522,423	$7,779
1922	5,090,000,000	537,886	9,462

TABLE 9

ESTIMATED INCOME OF THE PEOPLE OF IOWA COMPARED WITH THE TOTAL PUBLIC SCHOOL ENROLLMENT[18]

Year	Estimated Income	Total School Enrollment	Income per Pupil
1915	$ 903,000,000	522,423	$1,728
1921	1,347,000,000	547,272	2,461

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[17] *The Statistical Abstract of the United States*, 1922, Bureau of Foreign and Domestic Commerce, pp. 103, 625.

[18] Russell, W. F., *Financing of Education in Iowa*. (Published as part of Finance Inquiry Series).

TABLE 10

RATE OF GROWTH IN TAXABLE VALUATION AND SCHOOL ENROLLMENT

City	Annual Rate of Growth in Taxable Valuation	School Population
Burlington	2.00%	0.56%
Cedar Rapids	4.70	2.90
Clinton	2.45	1.55
Council Bluffs	3.70	3.20
Davenport	3.30	3.20
Des Moines	6.20	4.80
Dubuque	2.40	0.004
East Waterloo	2.65	1.35
Fort Madison	5.50	4.80
Ottumwa	3.90	2.72
Sioux City	7.90	4.50

Burlington can in 1923 produce $1.24 per pupil per mill of taxation for each pupil gained since 1912. In addition, she can produce on her total pupil enrollment $.19 more per pupil in 1923 than in 1912. This combined increase of taxable wealth on a per-pupil basis should take care of the costs due to growth in school population.

The question of depreciated currency is involved since the income available is based upon the assessed valuation of property over a term of years. Using the index of wholesale prices, with 1913 taken as a base year, we assume that in 1913 one dollar purchased one dollar's worth of commodities. In 1922, on this basis, $1.49 was required to purchase the same goods. If the assessed valuation of properties is likewise inflated we should expect to find the proportion of increase to be the same. Contrary to our expectation the total assessed valuation is practically the same. In

TABLE 11

GROWTH IN TAXABLE VALUATION COMPARED WITH GROWTH IN SCHOOL POPULATION

City	Tax Yield per Mill per Pupil Enrolled 1907-17*	1923	Gain per Pupil Enrolled for each Mill in 1923
Burlington	$1.05	1.24	$.19
Cedar Rapids	1.10	1.33	.23
Clinton	.93	1.05	.12
Council Bluffs	.74	.78	.04
Davenport	1.63	1.65	.02
Des Moines	1.31	1.62	.31
Dubuque	2.27	2.59	.32
East Waterloo	.60	.69	.09
Fort Madison	1.00	1.01	.01
Ottumwa	.66	.81	.15
Sioux City	1.16	1.75	.59

* The dates differ in this column for each city. Data not available for any given year.

districts where building has taken place one would expect correspondingly increased assessments due to such growth. The evidence shows that total assessed valuations are approximately the same year after year, excepting where growth has been in evidence, and here the increase is very small in amount. It appears then that in general the assessed valuations have, over a period of years, remained fairly constant, though building has gone on and property values increased, thus substantiating the claim made that actual wealth increases have attended increases of growth in school population.

CHAPTER IV

DRAFTING THE BONDING PROGRAM

The essential elements of a bonding program have been reviewed in the previous chapter. These items will now be combined to illustrate how to draft the bond program. The method varies slightly for situations in the large city as contrasted with that employed in the district with but one school building and a single bond issue. In principle, however, they are identical. A brief statement of the theory underlying the procedure recommended is presented first.

THEORETICAL ASPECTS OF THE PROBLEM

Capital outlay for school construction necessitates either a direct tax or the issuing of bonds. While the former plan may be the more desirable, it cannot always be utilized. Consequently, school districts bond themselves for the purpose of erecting schools. The indebtedness thus incurred must, according to law, be paid within a stated time. The length of term of school bonds in the United States varies from ten to forty years, and in some states bonds may be refunded. Sound financing requires that bonds issued for a given improvement should be retired within the lifetime of the improvement. Further, it is expedient that the burden representing capital outlay for school construction should be paid in approximately equal installments. Serial bonds are therefore recommended. No one generation should pay more or less than its just share of such expense. This does not mean that for each improvement an equal distribution of payments should be made but for the total outlay of a city over a period of years equalization should be affected in the payment of interest and the retirement of the bonds. It is evident that for a given city with numerous buildings, erected at different times, replacements will necessarily occur irregularly; so, too, the erection of additional units. Obviously, then, in order to equalize the burden of debt service, present as well as future, obligations must be considered. The present and future income derived from tax revenues likewise must be estimated for each year of the bond program. An optimum annual payment should be established. Therefore, the necessity of including both present and possible future expenditures and incomes is apparent. Nor should a bonding policy ever be established without reference to the total school budget. Summarizing briefly, the bonding program should not be determined without a careful study of the rates of growth of both the school population and the school tax revenue, the existing debt obligations, present needs, possible future needs and the relation of the total debt service costs to the total school budget and the ability to pay.

The maximum bonding load for a given city is represented by the total initial amount required to purchase sites, erect and equip schools sufficient to meet the needs of the city. This total obligation must be paid within a given period and should form the basis upon which bond amortization should be calculated. Since bonds may be issued for various purposes in different states, only such items of capital outlay should be considered for which bonds may be issued in estimating the maximum bonding load referred to above.

The length of the bonding period for a given improvement depends upon the legal limit of bond maturity and the available annual income for debt service. For school districts with but one building the solution is quite simple, as will be illustrated later. For cities having numerous buildings where additions and replacements occur frequently, it is more complicated. In such cases the obligation assumes a continuing character with bond retirement and new issues constantly being executed. To equalize the burden of such a program and to avoid an approach to the legal bond limit the average outstanding debt should not exceed one-half of the initial building cost or maximum bonding load. That is, at any time the total outstanding debt should not exceed one-half the amount required to house the present school population adequately. An unusually large debt is thus avoided and an equalization of the burden more easily effected. It is assumed that growth in taxable income will take care of growth in school population. When new bond issues are added the indebtedness will be greater than this amount and between such times when additions are made the total debt will be at its minimum figure. A well established program will show intervals of minimum indebtedness and peaks when expansion occurs, but the debt service will be more or less constant and in growing cities gradually increasing in proportion to the growth of income and school population, but not from the standpoint of the tax burden. Should the debt be considerably greater than one-half the total initial cost of providing facilities for all children, especially when such indebtedness approaches the bond limit, then replacements or additions must be postponed until it can be sufficiently reduced. Many cities to-day face this situation which could have been avoided by efficient bonding schedules.

It is necessary in the continuing program to ascertain the optimum amount of bonds to issue at stated intervals, perhaps five or ten years. This can be done by dividing the total initial cost by the number of years in the bonding schedule and then multiplying by the length of interval—5, 10, or other number, as the case may be. At no time should the length of term exceed the life of the improvement and if possible it should be less. Since the debt service is in direct relationship to the amount of outstanding bonds, when a specific period of amortization is selected, it approximates an optimum amount according to the above plan of bond program.

The Debt Service Table presented on page 48 is arranged so that the length of time required to liquidate a debt may be selected to meet local conditions and in terms of the mill levy advisable.

The school debt service so determined should be the basic debt service for the city. Since such amount is based on the total situation, any city lagging behind in school bond retirement must of necessity either postpone replacement or make up its payments by increasing its levy above the optimum amount until such debt is reduced to at least one-half of the initial building costs. By this method a heavy indebtedness due to postponed payments is scattered over a term of years, equalizing the burden. A city without a large debt, due to a good bonding policy, is more favorably situated providing its plant is adequate. By using the proposed table and method, situations should ultimately approach the theoretical base advocated. It will be noted that considerable freedom may be exercised in retiring an individual bond issue. This is always essential. The discussion above refers primarily to the total situation.

SUMMARY

1. The amount required to house the total school population should be entirely liquidated during the accepted life period. This

period may or may not be the exact life of the building but should never exceed it nor exceed the legal limits of bond maturity. The annual debt service includes bonds liquidated during the period plus interest payments.

2. The average outstanding debt should not exceed one-half of the total initial cost of the school plant.

3. The total amount of bonds added, during the period, should approximately equal the total initial cost of building. In cases of heavy indebtedness this will be correspondingly less in amount.

4. Growth in taxable valuation should provide sufficiently for the increase in school population.

5. Cities whose ability to pay is limited or which are heavily bonded face one of three possibilities: (a) to levy a higher tax in order to amortize the debt within the accepted period; (b) to provide an extension of the time to maturity, which means buildings must be used longer; or (c) to erect cheaper buildings. Combinations of the three may be necessary in some cases.

6. Where more than one bond issue exists no policy should ever be established on the basis of that one issue alone. The entire situation should be reviewed carefully and a program that is all-inclusive be formulated. The formula proposed in this study applies to a single bond issue only when the district has but one school building.

DRAFTING THE BONDING PROGRAM: REQUIRED INFORMATION

1. *Adequacy*

To know approximately the amount required to provide school facilities for the children now enrolled who are not adequately taken care of, either because of over-crowded conditions or because of poor building facilities is important. It is necessary to ascertain the number of children for whom provision must be made, which buildings need additions, which need to be replaced, which improved, etc. These are pertinent questions relating to adequacy. Adequacy then embraces the present needs for immediate expansion and replacement and should be stated in terms of the money needed to make the present plant adequate.

2. *Replacement*

Likewise it is necessary to ascertain which buildings will need to be replaced in the near future. An estimate of replacement based on the findings of a score card and other vital factors should be made covering the period selected. This should be figured on a cost basis also. The approximate number of pupils represented by necessary replacement should be tabulated. A table should be compiled showing the approximate date of replacement for all buildings, designating the type and capacity of each building listed.

3. *Growth in School Population*

Growth in school population should be predicted for the period chosen. This should be in terms of total school enrollment and by school divisions, *i. e.,* elementary, junior and senior high school groups. A table showing predicted pupil growth by school divisions arranged by annual or five-year periods is required. It is necessary to check carefully these computations with the expected growth of the city population and other factors.

4. *Growth in Taxable Property*

Growth in taxable property must be predicted for the same period as that of school population. The predicted taxable values form the basis of anticipated revenue.

5. *Present Enrollment*

The present total enrollment for each type of school should be carefully tabulated. This forms the basis of total housing cost estimates.

6. *Building Costs*

The approximate building costs for each type of building at present rates of construction on a pupil basis must be secured. This information is available through reliable architects or by inquiry in the immediate vicinity where schools have been built recently. The total cost of the building equipment and plot divided by its pupil capacity is the index required. The combined building cost per pupil for the city as a whole must also be calculated, including all types of schools.

7. *Bond Limit*

The legal limit in the amount of bonds permitted for buildings, sites, etc., should be ascertained, also the total amount of outstanding bonds and the per cent of unused bonding power. The total amount of bonds legally possible for each year of the proposed program must be known.

8. *Debt Service Limit*

The maximum annual legal debt service amount should be ascertained. On the basis of predicted growth of income this item should be arranged in tabular form for the entire period.

9. *Present Indebtedness*

The total outstanding bonds of the district by individual bond issues should be fully tabulated. Secure the date bonds were sold, rates of interest, dates of maturity, denominations, types of bonds, and provisions made for payment. If a serial bond, secure schedule of maturity dates with amounts and dates of retirement. It is important to have the entire bond schedule in detail. An accurate and complete record concerning bonds issued should always be available.

10. *Rates of Interest*

In order to outline a proposed bond program, it is necessary to ascertain the approximate market rate of interest paid on bonds.

11. *Sources and Amounts of Revenue*

Ascertain the basis of school support. In Iowa it is necessary to get the assessed valuations separately in the amounts of real and personal property and in the amounts of moneys and credits. This should be obtained over a series of years in order to show the rate of growth.

12. *Mill Yield*

The exact amount that one mill of taxation produces must be ascertained.

USE OF FORMULA IN ESTABLISHING THE DEBT SERVICE

Two fundamental steps are necessary in order to ascertain the average debt service upon which to construct the bond schedule. The steps outlined and the table of debt service values presented will indicate the amount required to liquidate the required outstanding bonds of a district on the basis of the actual income of such district under existing conditions for the amortization period chosen.

STEP I. THE MILL UNIT INDEX OF INCOME

$$\frac{\text{Amount produced by one mill}}{\text{Total school enrollment}} = \text{Index of income}$$

Secure the amount that one mill will produce for the last year that such data are available. Divide this amount by the total school enrollment of that year. The result is the index of income. It represents the amount of money that one mill will produce per pupil enrolled.

In the table following, the index begins at .75 and extends to 4.50. The table is based on a $100 per pupil building cost. By multiplying the mill levy ascertained by the ratio of the actual per-pupil building cost by the $100 per-pupil rate, the required levy may be ascertained. The majority of schools in Iowa fall between 1.00 and 2.00. An index between any two indices, for example, an index of 1.27, would fall between 1.20 and 1.30. By securing the required number of mills at the base year selected for both indices, interpolation will give the approximate mill rate.

STEP II. ASCERTAINING THE DEBT SERVICE

By use of the Debt Service Table the number of mills required annually to liquidate the bonded debt within a given period can be ascertained. The table is so arranged that the period of years during which the debt is to be liquidated may be selected. It is recommended that a period of twenty years be chosen, especially for Iowa, since in this state bonds must be refunded after such time. Should a longer period be necessary, refunding provisions must be made in the program.

To Ascertain Mill Levy

Move to the right of the index number on the table to the column giving the number of years selected in which to mature the bonds. In the corresponding column will be found the annual mill levy on a $100 basis; multiply by the ratio to true building costs to ascertain the exact mill levy required.

Where the per-pupil cost of building varies between the amounts as shown in the table, interpolation will secure the approximate levy. For example: an index of 2.00 at a cost of $300 per pupil, for a twenty-year period requires 12.03 mills (4.01x3). The same index at a cost of $3.50 per pupil, for twenty years, requires 14.04 (4.01x3.5). For $325, 13.01 mills will be necessary.

TABLE 12

Debt Service Table

Mill Levy Required to Liquidate Bonds in Years Indicated on the Basis of $100 per Pupil for Building Costs

Index of Income	10	15	20	25	30	35	40
	Number of years required for bonds to mature						
4.50	2.88	2.14	1.78	1.58	1.45	1.36	1.29
4.25	3.05	2.27	1.89	1.67	1.53	1.42	1.37
4.00	3.24	2.41	2.01	1.77	1.63	1.53	1.46
3.75	3.45	2.57	2.14	1.89	1.74	1.63	1.55
3.50	3.70	2.75	2.29	2.03	1.86	1.75	1.67
3.25	3.98	2.97	2.47	2.18	2.00	1.89	1.79
3.00	4.32	3.21	2.67	2.37	2.19	2.03	1.94
2.90	4.47	3.32	2.77	2.45	2.24	2.11	2.01
2.80	4.63	3.44	2.87	2.53	2.32	2.18	2.08
2.70	4.80	3.57	2.97	2.63	2.41	2.26	2.16
2.60	4.98	3.71	3.09	2.73	2.50	2.35	2.24
2.50	5.18	3.85	3.21	2.83	2.60	2.44	2.33
2.40	5.40	4.01	3.34	2.96	2.71	2.55	2.43
2.30	5.63	4.19	3.49	3.09	2.83	2.65	2.53
2.20	5.89	4.38	3.65	3.23	2.96	2.77	2.65
2.10	6.17	4.59	3.82	3.38	3.10	2.91	2.77
2.00	6.47	4.82	4.01	3.55	3.25	3.05	2.91
1.90	6.82	5.07	4.22	3.73	3.42	3.21	3.07
1.80	7.19	5.35	4.48	3.94	3.61	3.37	3.24
1.70	7.62	5.67	4.72	4.17	3.83	3.59	3.43
1.60	8.09	6.02	5.01	4.43	4.07	3.82	3.64
1.50	8.63	6.42	5.35	4.73	4.34	4.07	3.89
1.40	9.25	6.88	5.73	5.07	4.65	4.36	4.16
1.30		7.41	6.17	5.46	5.00	4.70	4.48
1.20		8.03	6.69	5.91	5.42	5.09	4.86
1.10		8.76	7.29	6.45	5.91	5.55	5.30
1.00		9.63	8.02	7.09	6.51	6.11	5.83
.90			8.91	7.88	7.23	6.79	6.47
.80				8.87	8.13	7.63	7.29
.75				9.46	8.67	8.14	7.77

The Debt Service Table

On page 48 will be found the Debt Service Table. The formula used in computing the table appears in the appendix of this study (on file in the Library of the University of Iowa). The table has been computed for building costs at $100 per pupil enrolled. By interpolation, various amounts may be used as basic building costs since all items of the table are in direct relationship to one another.

ILLUSTRATIONS OF THE USE OF THE BONDING FORMULA

A. MEDIUM SIZE SCHOOL DISTRICT

Below are given in summary the data required and the procedure followed in constructing a bonding program. The complete tables are omitted here. An Iowa city of 50,000 population was selected.

1. *Present Enrollment*

Elementary schools	5,827
Junior high schools	2,006
Senior high schools	1,431
Total school population 1923	9,264

2. *Building Costs per Pupil*

Elementary schools	$300
Junior high schools	400
Senior high schools	500

Present enrollment by types of schools and building costs

5,827×$300=$1,748,100
2,006×$400= 802,400
1,431×$500= 715,500

$3,266,000 estimated initial building cost (amount used)

$$\frac{\$3,266,000}{9,264}=\$350 \text{ approximate gross building cost per pupil}$$

3. *Adequacy*

The present needs require 1,000 elementary pupil accommodations, 2,000 junior high school and 1,736 senior high school accommodations, therefore:

Elementary schools 1000×$300=$300,000
Junior high schools 2000×$400= 800,000
Senior high schools 1736×$500= 868,000

$1,968,000

$1,968,000—$160,000 (cash available)=$1,808,000, the amount required for adequacy. This amount will make the present plant entirely adequate, including necessary present replacement and immediate growth needs. Adequacy should always provide amply for the immediate period.

4. *Replacement*

The initial cost of building, $3,266,000, represents the housing cost for the 9,264 pupils of the city and should serve approximately twenty years. Consequently each year one-twentieth is theoretically to be replaced, on the assumption that a continuous program is in effect. Practically schools will not be replaced in this way. In medium sized cities building occurs in periods of five or more years. The total bonds added during the entire period should equal the inital cost of building. This would provide complete replacement. $3,266,000—$1,808,000=$1,458,000, the amount of bonds required for replacement. Since the excess indebtedness at the beginning of the period is $438,250, the actual amount for replacement should be $1,019,750. In the program accepted $1,000,000 was actually provided for this purpose. (See item 13).

5. *Growth in School Population and Taxable Property*

School population	2.9 per cent:	3 per cent was used
Taxable valuation	4.7 per cent:	4.5 per cent was used

(Tables omitted here)

6. *Bond Limit*

The legal bond limit in 1923 was $2,896,964.

7. *Debt Service Limit*

In 1923 the debt service limit was $405,576.

8. *Mill Yield*

In 1923 one mill produced $12,335.

9. *Sources and Amounts of Revenue*

Total assessed valuation, 1923, $57,939,296.

10. *Present Indebtedness*

Present indebtedness	$1,663,000
Cash on hand	160,000
Unused bonding capacity	1,233,964

Detail of actual issues outstanding omitted here.

11. *Rates of Interest*

The predominating rate of interest in 1923 was 5 per cent. This rate was used in drafting the program, although the rates were declining.

12. *Index of Income*

$$\frac{\text{Amount one mill produces}}{\text{School enrollment}}=\text{Index of income}$$

$$\frac{12{,}335}{9{,}264}=1.33 \text{ Index of income}$$

13. *Optimum Indebtedness*

The optimum indebtedness on the basis of present enrollment is one-half of \$3,266,000, or \$1,633,000. As mentioned elsewhere, bonds are to be inserted at the minimum point of indebtedness and in intervals of five years or more. Therefore, on a twenty-year basis of five-year intervals, $\frac{1{,}633{,}000}{4}$ =\$408,250, the amount to be added each five years. The minimum indebtedness therefore should not exceed \$1,633,000—\$408,250, or \$1,244,750. The present debt of \$1,663,000 is therefore \$438,250 in excess of this amount, consequently the amount for replacement was reduced by this amount.

14. *Ascertaining the Debt Service*

In accordance with the legal limit of indebtedness for schools in Iowa and because of the amount of the present debt and the adequacy needs in this city, a twenty-year period has been selected within which to retire the bonds.

15. *To Ascertain Mill Levy*

Locating the index number on the Index of Income Table we find no index of 1.33. The nearest amount given is 1.30. The next highest amount given is 1.40. Proceed to the right on index 1.30 to the twenty-year column. The mill indicated is 6.17. Do the same for the index 1.40. The mill indicated is 5.73. By interpolating, 6.00 is found to be the approximate levy. Multiplying by 3.5 we find 21 mills the required levy. (Since the table is built on the basis of \$100 and the present average cost of building is \$350 per pupil, multiply by 3.5.) 21x\$12,335=\$259,035, the annual optimum debt service required on a twenty-year bond retirement basis.

16. *Growth Not Included*

In order to show the bonding schedule with and without the growth trends, two tables were prepared. Table 13, below, shows the program without growth included. In the first five years $1,808,000 is added for adequacy. The outstanding debt prevented the adding of the entire amount in the first year. The $1,000,000 for replacement was added in two installments later.

17. *Growth Included*

With a growth rate of three per cent in school population and four and five-tenths per cent in taxable valuation growth must of necessity be considered. In twenty years the estimated school popu-

TABLE 13

Annuity Bond Table, City A

Present indebtedness plus amounts required for adequacy and replacement. Basis 20 years (growth not included)

Year	Bonded Debt	Bonds Sold	Annual Interest	Bonds Retired	Debt Service
1924	$1,663,000	$ 358,000	$ 101,050	$ 158,000	$ 259,050
1925	1,863,000	750,000	130,650	128,500	259,150
1926	2,484,500		124,225	135,000	259,225
1927	2,349,500		117,475	141,500	258,975
1928	2,208,000		110,400	148,500	258,900
1929	2,059,500		102,975	156,000	258,975
1930	1,903,500	700,000	130,175	129,000	259,175
1931	2,474,500		123,725	135,000	258,725
1932	2,339,500		116,975	142,000	258,975
1933	2,197,500		109,875	149,000	258,875
1934	2,048,500		102,425	156,500	258,925
1935	1,892,000	500,000	119,600	139,500	259,100
1936	2,252,500		112,625	146,500	259,125
1937	2,106,000		105,300	153,500	258,800
1938	1,952,500		97,625	161,500	259,125
1939	1,791,000		89,550	169,500	259,050
1940	1,621,500	500,000	106,075	153,000	259,075
1941	1,968,500		98,425	160,500	258,925
1942	1,808,000		90,400	168,500	258,900
1943	1,639,500		81,975	177,000	258,975
1944	1,462,500				
Totals		$2,808,000	$2,171,525	$3,008,500	$5,180,025

Indebtedness at beginning of period	$1,663,000
Indebtedness at end of period	1,462,500
Amount provided for adequacy	1,808,000
Amount provided for replacement	1,000,000
Average annual debt service (actual)	259,001

TABLE 14

Annuity Bond Table, City A

Present debt, adequacy, replacement, and growth included
Rates of growth: School population 3%, taxable property 4.5%
Basis, 20 years

Year	Outstanding Bonds	Bonds Sold	Theoretical Debt Service 4.5% Incr.	Annual Interest	Bonds Retired	Actual Annual Debt Service
1924	$1,663,000	$ 358,000	$ 259,035	$ 101,050	$ 158,000	$ 259,050
1925	1,863,000	750,000	270,692	130,650	140,000	270,650
1926	2,473,000		282,873	123,650	159,000	282,650
1927	2,314,000		295,602	115,700	180,000	295,700
1928	2,134,000		308,904	106,700	202,000	308,700
1929	1,932,000		322,805	96,600	226,000	322,600
1930	1,706,000	700,000	337,331	120,300	217,000	337,300
1931	2,189,000		352,511	109,450	243,000	352,450
1932	1,946,000		368,374	97,300	271,000	368,300
1933	1,675,000		384,951	83,750	301,000	384,750
1934	1,374,000		402,273	68,700	333,500	402,200
1935	1,040,500	1,500,000	420,376	127,025	293,500	420,525
1936	2,247,000		439,293	112,350	327,000	439,350
1937	1,920,000		459,061	96,000	363,000	459,000
1938	1,557,000		479,718	77,850	402,000	479,850
1939	1,155,000		501,306	57,750	443,500	501,250
1940	711,500	2,000,000	523,865	135,575	388,500	524,075
1941	2,323,000		547,438	116,150	431,500	547,650
1942	1,891,500		572,073	94,575	477,500	572,075
1943	1,414,000		597,816	70,700	527,000	597,700
1944	887,000					
		$5,308,000		$2,041,825	$6,084,000	$8,125,825

Debt at beginning of period	$1,663,000	
Debt at end of period	887,000	
Amount provided for adequacy	1,808,000	
Amount provided for replacement	1,000,000	
Amount provided for growth	2,500,000	
Average annual debt service	259,035	Plus increases

lation will be 16,731. At the estimated cost per pupil it would require at present costs $2,613,450 to house these additional children. For growth, $2,500,000 was actually allowed. Schools should check building costs frequently so as to make ample provision for this item. The rates of growth should likewise be checked from time to time.

The average annual debt service required was $259,035. This must be increased annually by four and five-tenths per cent to provide for growth. Table 14 on page 53 shows the bonding program with growth included. A similar table has been prepared, but is not included here, with growth in both taxable wealth and pupil enrollment figured at the same rate, namely three per cent. Even on an equal basis, growth will take care of growth adequately.

B. ONE-BUILDING SCHOOL DISTRICT

Districts with only one building will find the proposed formula and table quite an advantage. In general, for such districts, the bond program is easier to construct. The proposed building should provide for adequacy, replacement, and growth, inasmuch as the one building will house the total school population. The index of income is found in the manner previously explained. The mill levy is also determined for the period chosen, as described on page 47. The mill levy thus ascertained multiplied by the amount one mill produces will give the debt service amount required annually. By deducting the annual interest from this amount, the amount available to apply on bond retirement may be found. Such amount should be figured in units of $500 or $1000 since bonds are preferably sold in such denominations.

For the one-building situation the gross bonded debt will equal the total initial building cost in place of one-half of such amount as recommended in the discussion on the theory of bonding at the beginning of this chapter. It is therefore advisable to ascertain carefully the amount of annual debt service a district can safely pay. Frequently it may be necessary to extend the debt over a longer than twenty-year period, refunding part of the bond issue for an extended period of short duration. However, this should not be done if it can possibly be avoided.

An illustration follows in Table 15.

TABLE 15

ANNUITY BOND TABLE FOR A DISTRICT WITH BUT ONE BUILDING

Basis, 20 years. Cost of building $205,000. Number of pupils 586. Average building cost per pupil, $350.
No other outstanding bonded debt exists.

Year	Outstanding Bonds	Annual Interest	Bonds Retired	Annual Debt Service
1921	$205,000	$ 10,250	$ 6,000	$ 16,250
1922	199,000	9,950	6,500	16,450
1923	192,500	9,625	7,000	16,625
1924	185,500	9,275	7,000	16,275
1925	178,500	8,925	7,500	16,425
1926	171,000	8,550	8,000	16,550
1927	163,000	8,150	8,500	16,650
1928	154,500	7,725	7,000	16,725
1929	145,500	7,275	9,000	16,275
1930	136,500	6,825	9,500	16,325
1931	127,000	6,350	10,000	16,350
1932	117,000	5,850	10,500	16,350
1933	106,500	5,325	11,000	16,325
1934	95,500	4,775	11,500	16,275
1935	84,000	4,200	12,500	16,700
1936	71,500	3,575	13,000	16,575
1937	58,500	2,925	13,500	16,425
1938	45,000	2,250	14,000	16,250
1939	31,000	1,550	15,000	16,550
1940	16,000	800	16,000	16,800
Totals		$124,150	$205,000	$329,150

One mill produces $1646

$$\text{Income index} = \frac{1646}{586} = 2.81$$

On a 20-year basis this index requires 10 mills
$1646×10=$16,460 the average annual debt service

BIBLIOGRAPHY

PRIMARY SOURCES

Books

Englehardt, N. L., *A School Building Program for Cities, 1918.* Teachers College, Columbia University, New York

Newcomer, Mabel, *Financial Statistics of Public Education in the United States, 1910-1920.* Educational Finance Inquiry Commission, The Macmillan Company, New York, 1924

Russell, W. F., Holy, T. C., Stone, R. W., and others, *The Financing of Education in Iowa,* Vol. VIII, Report of the Iowa Division of the School Finance Inquiry. The Macmillan Company, New York, 1924

Swift, Fletcher Harper, Graves, Richard A., and Tiegs, Ernest Walter, *Studies in Public School Finance. The East, Massachusetts, New York, New Jersey,* University of Minnesota, 1923

Government Publications, Pamphlets, etc.

Biennial Survey of Education 1918-1920, Bulletin, 1923, No. 29. Department of the Interior, Bureau of Education, Washington, D. C.

DelManzo, Milton C., *The Status of Bonded Indebtedness of Iowa Schools,* Master's Thesis, University of Iowa, Iowa City, 1922. (On file in Library of the University)

Financial Statistics of Public Education in the United States, 1910-1920, The Educational Finance Inquiry Commission, The Macmillan Company, New York, 1924

Kemmerer, E. W., *Variation in the Demand for Money,* National Monetary Commission, Senate Document No. 588, 61st Congress, 2d Session (February, 1911), Washington, D. C.

Research Bulletin National Education Association, Vol. II, Nos. 1 and 2, p. 53 (January and March, 1924), Washington, D. C.

Statistical Abstract of the United States, Bureau of Foreign and Domestic Commerce, Washington, D. C., 1922

Swift, Fletcher Harper, *A Biennial Survey of Public School Finance in the United States, 1920-1922.* Bulletin, 1923, No. 47, Department of the Interior, Bureau of Education, Washington, D. C.

SECONDARY SOURCES

Books

Babson, Roger W., *Business Barometers for Anticipating Conditions,* Babson Institute, Inc., Wellesley Hills, Massachusetts, 1921

Brown, Fraser, *Municipal Bonds,* Prentice Hall, New York, 1922

Chamberlain, Lawrence, *The Principles of Bond Investment,* Henry Holt and Company, New York, 1911

Chandler, Alfred D., *Metropolitan Debts of Boston and Vicinity,* (Brookline, Massachusetts, 1905)

Copeland, Melvin T., *Business Statistics,* Harvard University Press, Cambridge, Massachusetts, 1917

Dewing, Arthur Stone, *The Financial Policy of Corporations,* Vol. I, The Ronald Press Company, New York, 1920

Grunsky, Carl Ewald, *Valuation, Depreciation and the Rate-Base,* John Wiley and Sons, New York, 1917

Lagerquist, Walter Edwards, *Investment Analysis,* The Macmillan Company, New York, 1922

Lownhaupt, Frederick, *Investment Bonds,* G. P. Putnam's Sons, New York, 1908

Rietz, H. L., Crathorne, A. R., and Rietz, J. C., *Mathematics of Finance,* Henry Holt and Company, New York, 1923

Riggs, Henry Earle, *Depreciation of Public Utility Properties,* McGraw-Hill, Inc., New York, 1922

Rollins, Montgomery, *Muncipal and Corporation Bonds,* The Financial Publishing Company, Boston, 1920

Articles

Fowlkes, John Guy, "Justifying a Bond Issue for School Purposes," *American School Board Journal,* Vol. LXVI, No. 4 (April, 1923), pp. 49-51, Bruce Publishing Company, Milwaukee, Wis.

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